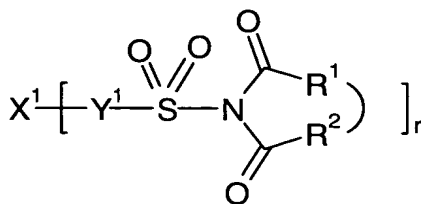


WE CLAIM:

1. A compound according to Formula I:



wherein

X^1 is a substrate-reactive functional group selected from a carboxy, halocarbonyl, halocarbonyloxy, cyano, hydroxy, mercapto, isocyanato, halosilyl, alkoxysilyl, acyloxysilyl, azido, aziridinyl, haloalkyl, tertiary amino, primary aromatic amino, secondary aromatic amino, disulfide, alkyl disulfide, benzotriazolyl, phosphono, phosphoroamido, phosphato, or ethylenically unsaturated group;

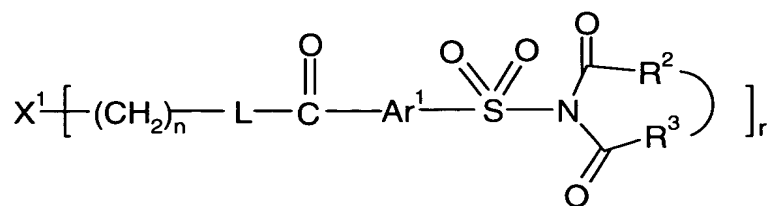
Y^1 is a single bond or a divalent group selected from an alkylene, heteroalkylene, arylene, carbonyl, carbonyloxy, carbonylimino, oxy, thio, $-NR^d$ where R^d is hydrogen or alkyl, or combinations thereof;

R^1 and R^2 together with a dicarboximide group to which they are attached form a four to eight membered heterocyclic or heterobicyclic group that can be fused to an optional aromatic group, optional saturated or unsaturated cyclic group, or optional saturated or unsaturated bicyclic group;

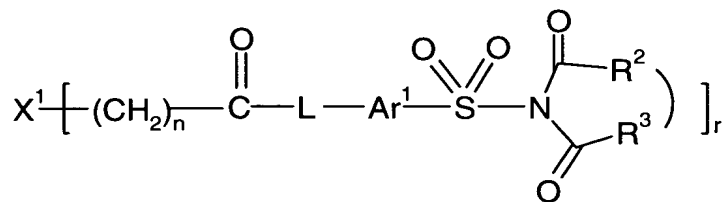
r is equal to 1 when X^1 is a monovalent group or equal to 2 when X^1 is a divalent group; and

said compound is unsubstituted or substituted with a halo, alkyl, alkoxy, or combinations thereof.

2. The compound of claim 1, wherein the compound is of formula



or



5 wherein

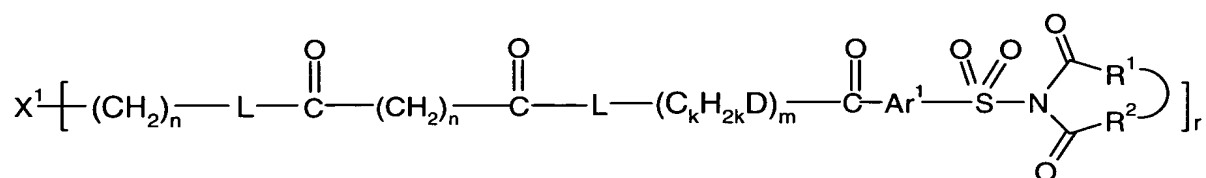
n is an integer of 1 to 100;

Ar¹ is an arylene; and

L is oxygen or NR^d where R^d is hydrogen or alkyl; and

10 said compound is unsubstituted or substituted with a halo, alkyl, alkoxy, or combinations thereof.

3. The compound of claim 1, wherein the compound is of formula



wherein

15 each n is independently an integer of 1 to 100;

m is an integer of 1 to 200;

Ar¹ is an arylene;

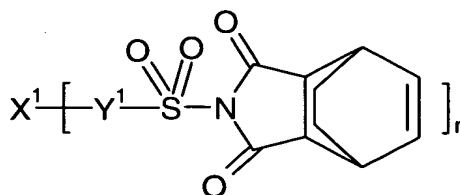
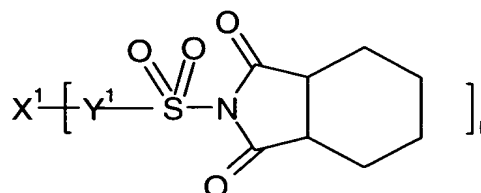
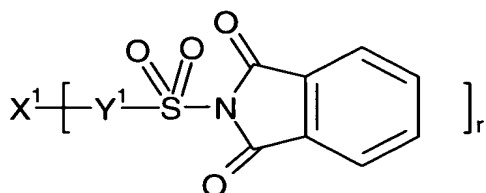
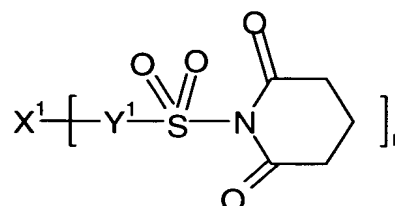
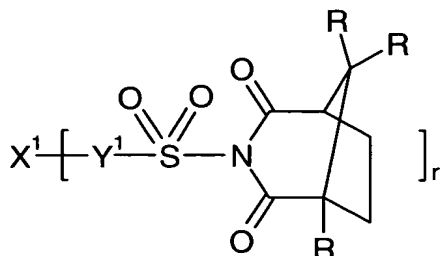
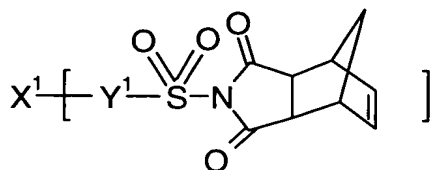
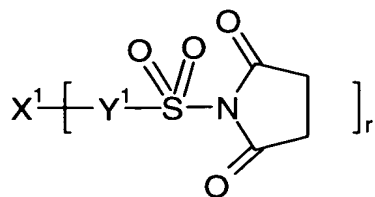
k is an integer of 2 to 4;

D is oxygen, sulfur, or NH;

20 L is oxygen or NR^d where R^d is hydrogen or alkyl; and

said compound is unsubstituted or substituted with a halo, alkyl, alkoxy, or combinations thereof.

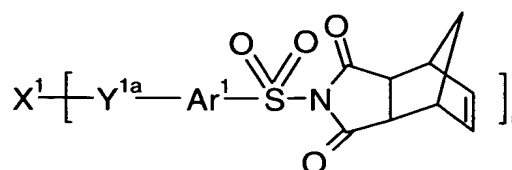
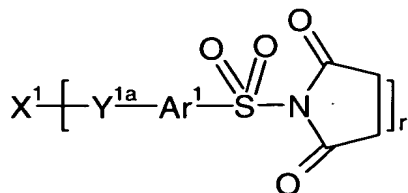
4. The compound of claim 1, wherein the compound is of formula

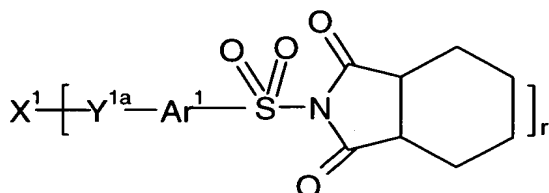
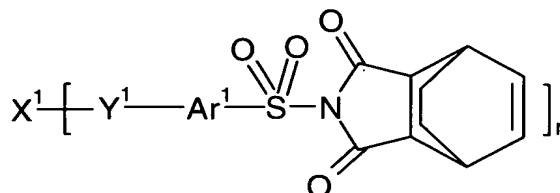
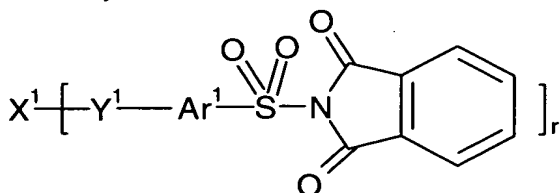
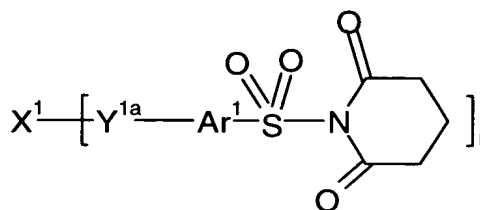


or

wherein R is an alkyl and said compound is unsubstituted or substituted with a halo, alkyl, alkoxy, or combinations thereof.

- 10 5. The compound of claim 1, wherein the compound is of formula



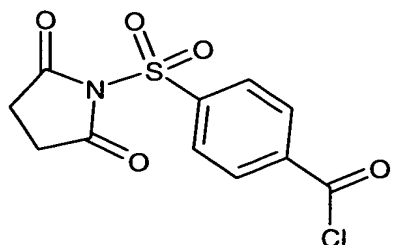
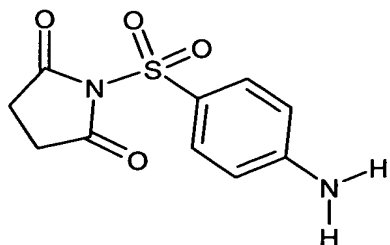


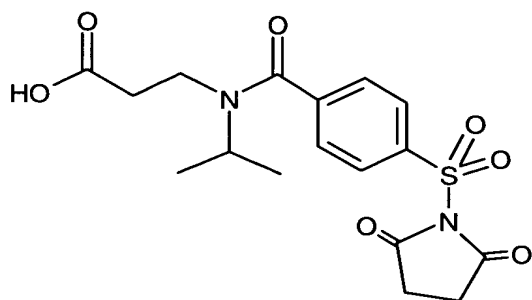
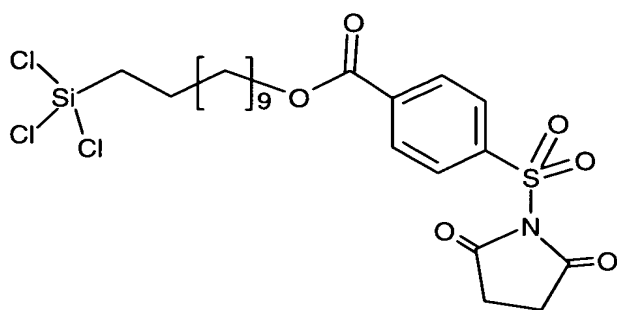
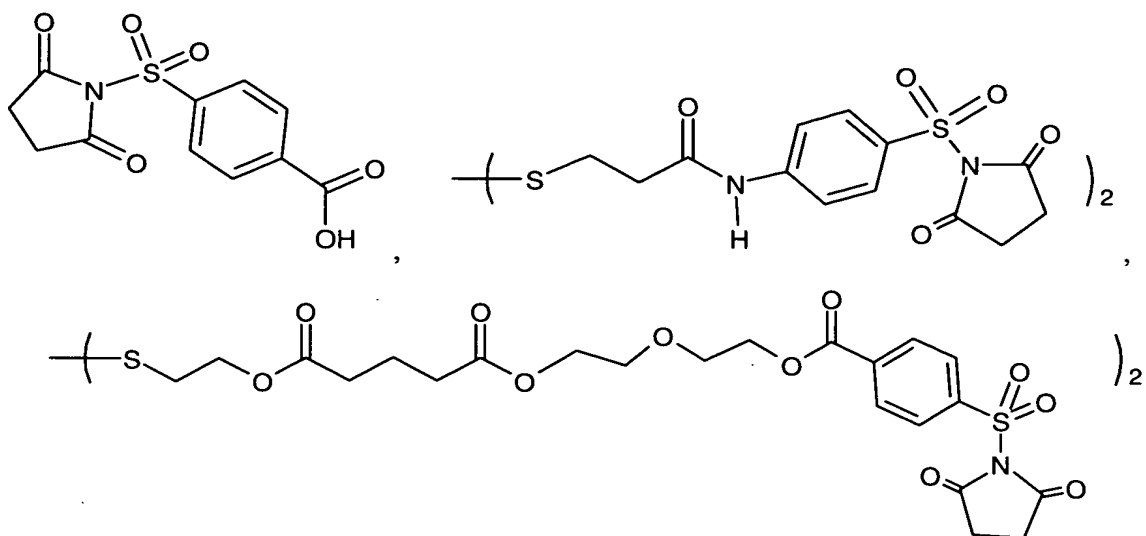
wherein

Y^{1a} is selected from a single bond, alkylene, heteroalkylene, carbonyl, carbonylimino, oxy, thio, -NR^d- where R^d is hydrogen or alkyl, or thereof; and

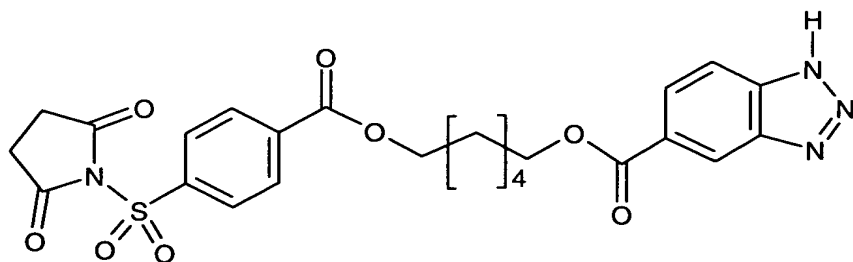
said compound is unsubstituted or substituted with a halo, alkyl, alkoxy, or combinations thereof.

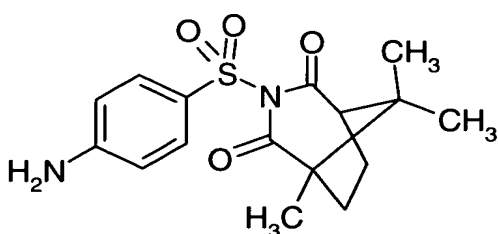
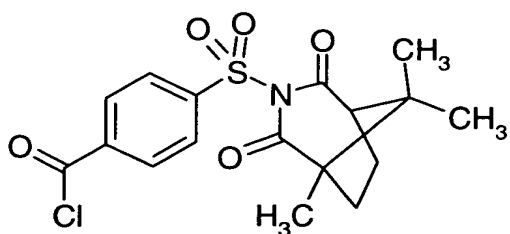
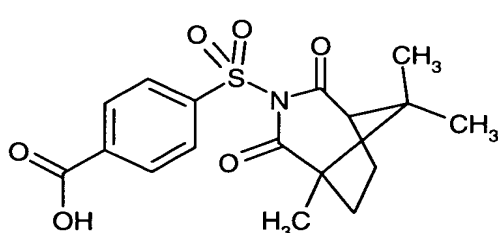
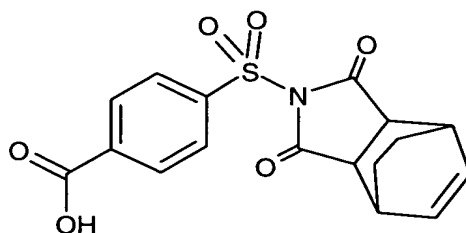
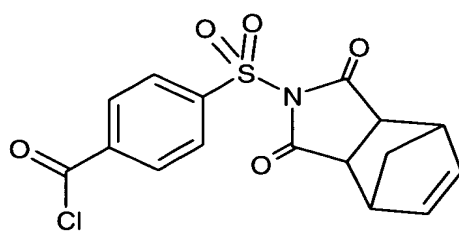
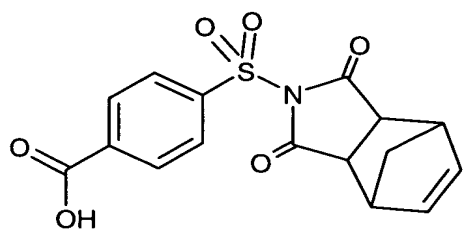
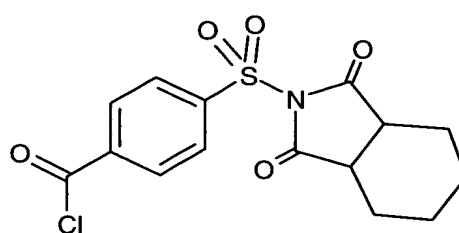
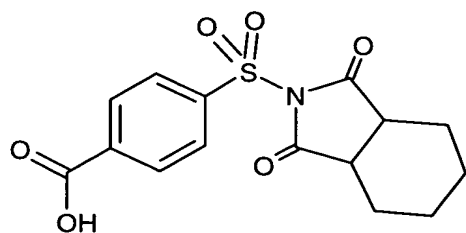
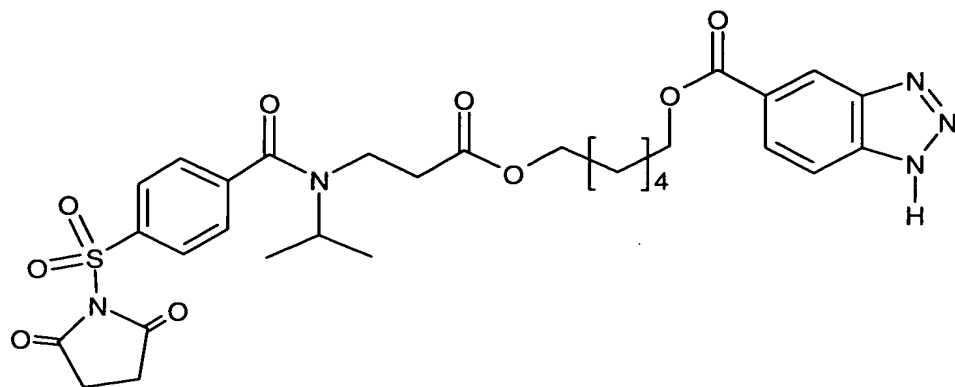
7. The compound of claim 1, wherein the compound is



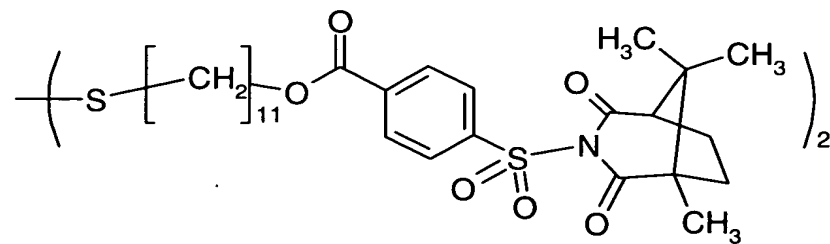
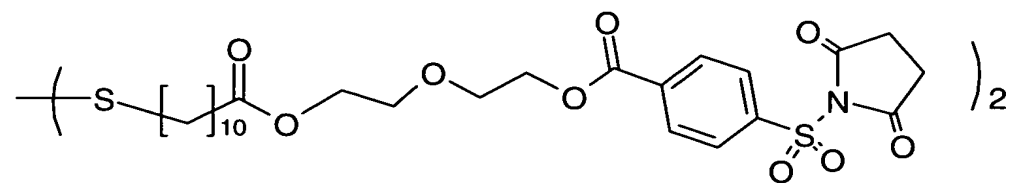
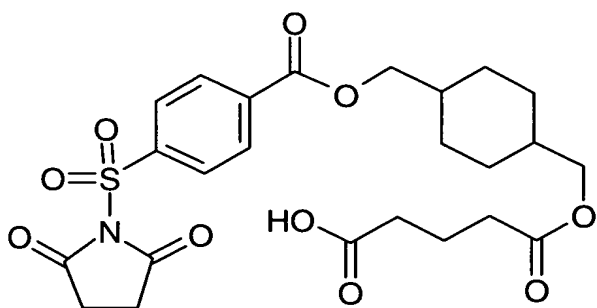
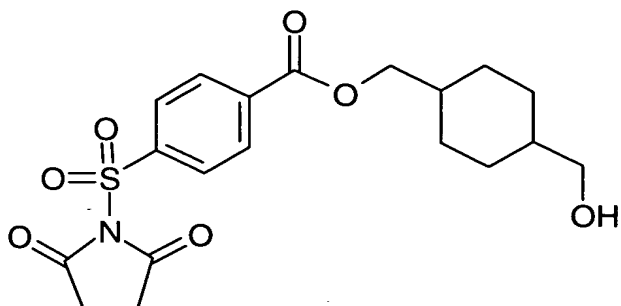
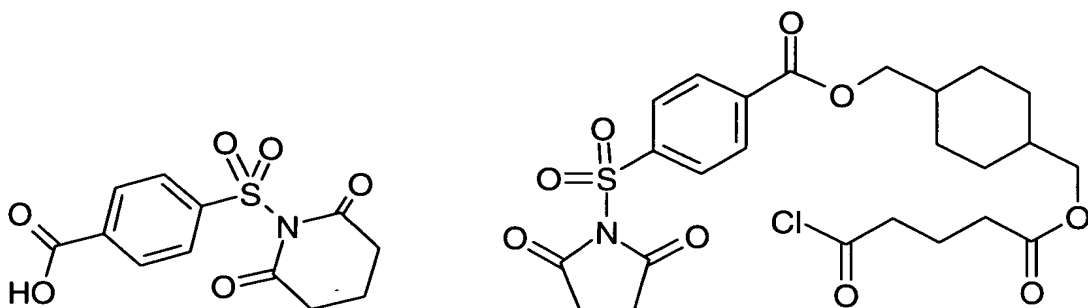


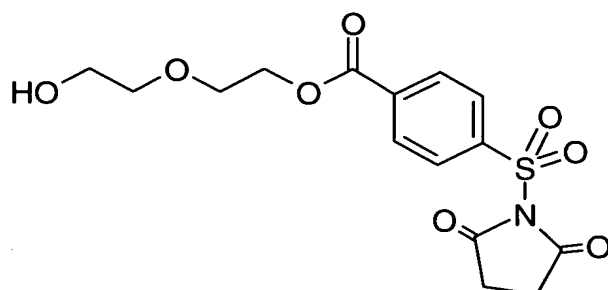
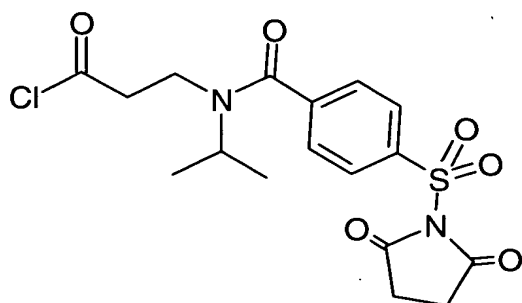
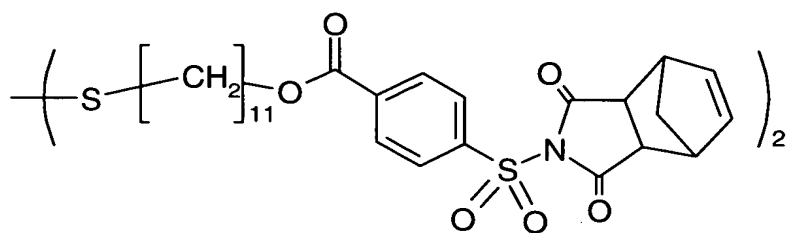
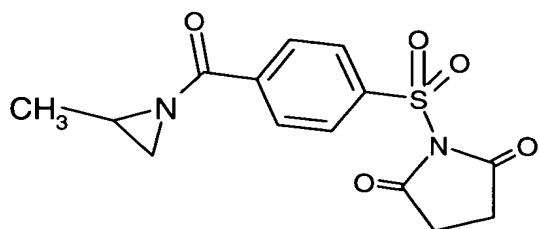
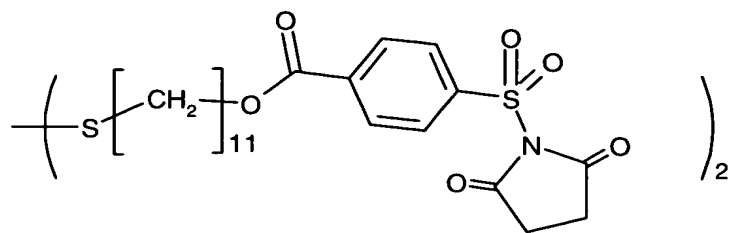
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amino, secondary aromatic amino, disulfide, alkyl disulfide, benzotriazolyl, phosphono, phosphoroamido, phosphato, or ethylenically unsaturated group;

R^4 and R^5 together with a dicarboximide group to which they are attached form a four to eight membered heterocyclic or heterobicyclic group that can be fused to an optional aromatic group, optional saturated or unsaturated cyclic group, or optional saturated or unsaturated bicyclic group;

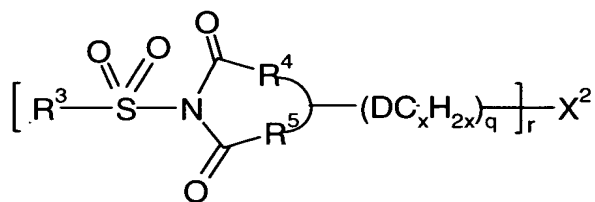
Y^2 is a single bond or a divalent group selected from an alkylene, heteroalkylene, arylene, carbonyl, carbonyloxy, carbonylimino, oxy, thio, $-NR^d$ where R^d is hydrogen or alkyl, or combinations thereof;

R^3 is an alkyl, aryl, aralkyl, or $-NR^bR^c$ wherein R^b and R^c are each an alkyl group or taken together with the nitrogen atom to which they are attached form a four to eight membered heterocyclic group;

r is equal to 1 when X^2 is monovalent or equal to 2 when X^2 is a divalent group; and

said compound is unsubstituted or substituted with a halo, alkyl, alkoxy, or combinations thereof.

10. The compound of claim 9, wherein the compound is of formula



wherein

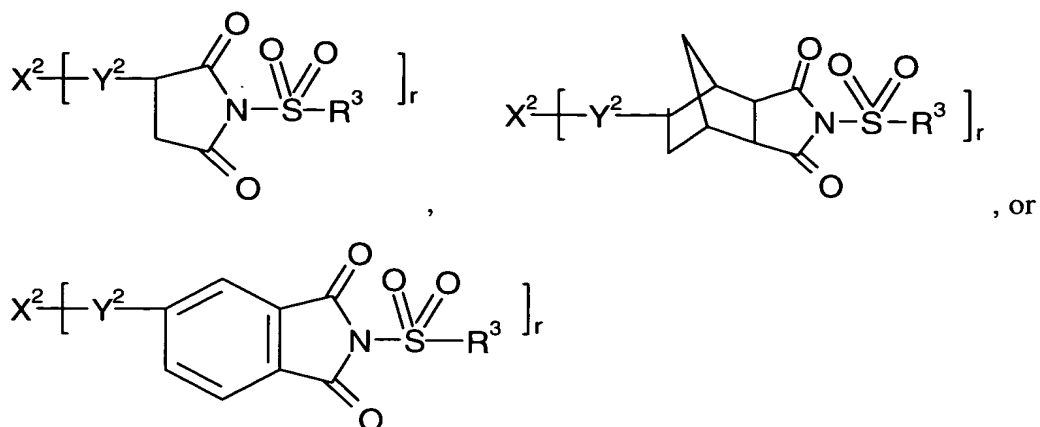
q is an integer of 1 to 200;

x is an integer of 1 to 4;

D is oxygen, sulfur, or NH ; and

said compound is unsubstituted to substituted with a halo, alkyl, alkoxy, or combination thereof.

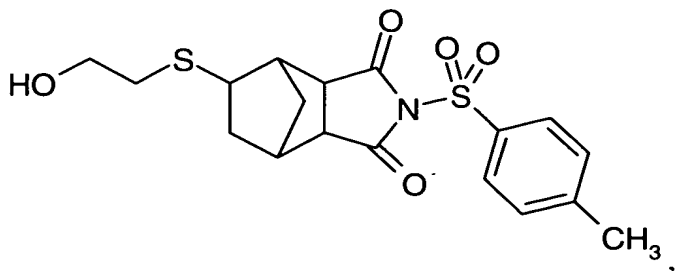
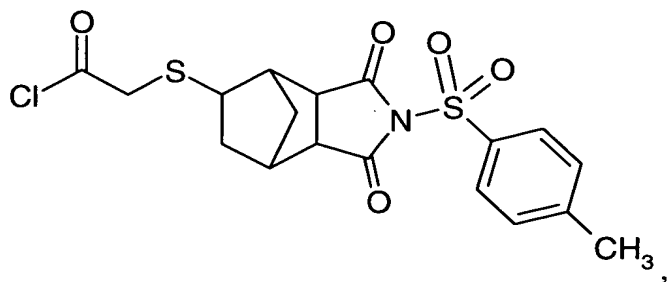
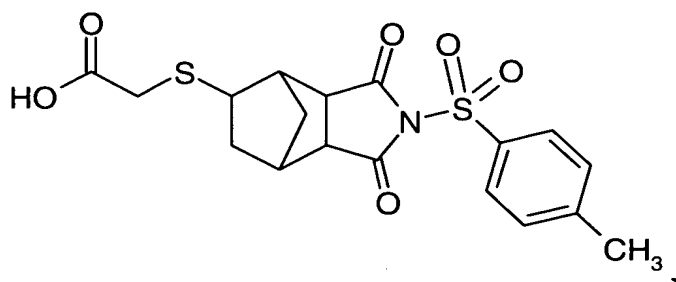
11. The compound of claim 10, wherein the compound is of formula

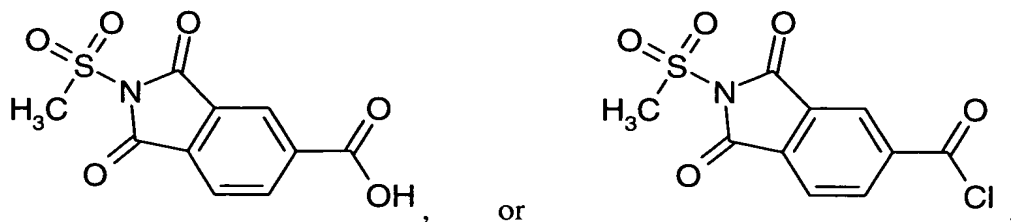


that is unsubstituted or substituted with a halo, alkyl, alkoxy, or combinations thereof.

5

12. The compound of claim 10, where the compound is





wherein said compound is unsubstituted or substituted with a halo, alkyl, alkoxy, or combinations thereof.

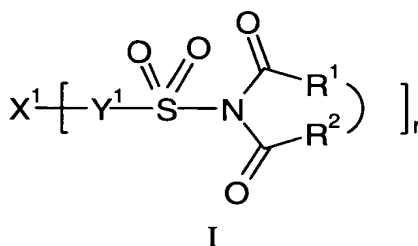
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13. An article comprising:

a substrate; and

a substrate-attached tethering group comprising a reaction product of a complementary functional group G on a surface of the substrate with a compound of Formula I

10



wherein

15 X^1 is a substrate-reactive functional group selected from a carboxy, halocarbonyl, halocarbonyloxy, cyano, hydroxy, mercapto, isocyanato, halosilyl, alkoxysilyl, acyloxysilyl, azido, aziridinyl, haloalkyl, tertiary amino, primary aromatic amino, secondary aromatic amino, disulfide, alkyl disulfide, benzotriazolyl, phosphono, phosphoroamido, phosphato, or ethylenically unsaturated group;

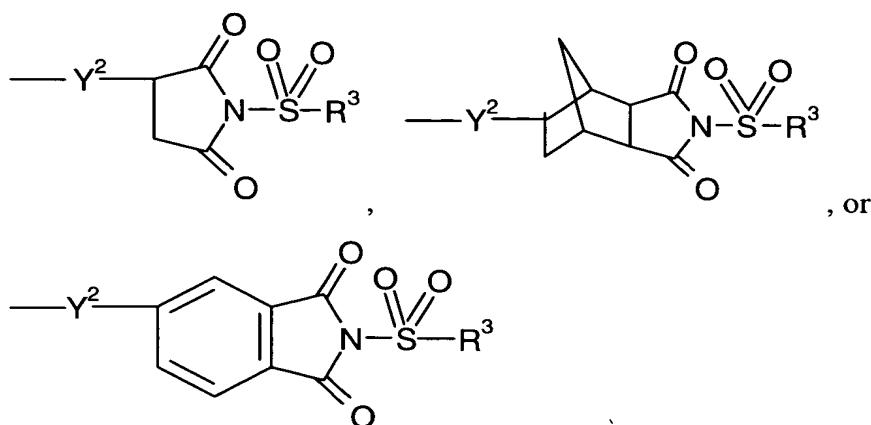
20 Y^1 is a single bond or a divalent group selected from an alkylene, heteroalkylene, arylene, carbonyl, carbonyloxy, carbonylimino, oxy, thio, or $-NR^d$ where R^d is hydrogen or alkyl, or combinations thereof;

25 R^1 and R^2 together with a dicarboximide group to which they are attached form a four to eight membered heterocyclic or heterobicyclic group that can be fused to an optional aromatic group, optional saturated or unsaturated cyclic group, or optional saturated or unsaturated bicyclic group;

r is 1 when X^2 is a monovalent group or equal to 2 when X^2 is a divalent group;

G is the complementary functional group capable of reacting with X^1 ; and said tethering group is unsubstituted or substituted with a halo, alkyl, alkoxy, or combinations thereof.

14. The article of claim 13, wherein the tethering group comprises an attachment group and a group selected from



that is unsubstituted or substituted with a halo, alkyl, carboxy, alkoxycarbonyl, nitrile, or combinations thereof.

15. The article of claim 13, wherein the substrate comprises a polymeric material.

16. The article of claim 13, wherein the substrate comprises a polyimide or polyester film.

17. The article of claim 13, wherein the substrate is multilayered and has an outer layer comprising diamond-like glass.

18. The article of claim 13, wherein the substrate is multilayered and has an outer layer comprising gold.

19 The article of claim 13, wherein the substrate is multilayered and comprises a polyimide or polyester layer, a diamond-like glass outer layer, and a diamond-like carbon layer positioned between the polyimide or polyester layer and the diamond-like glass layer.

5

20. The article of claim 13, wherein the substrate is a polymeric bead.

21. The article of claim 13, wherein the substrate is a bead comprising a polysaccharide.

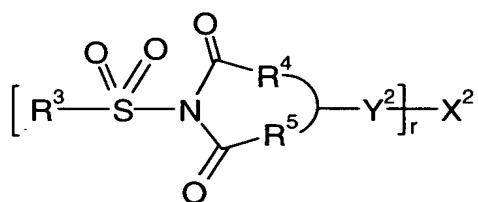
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22. An article comprising:

a substrate;

a substrate-attached tethering group comprising a reaction product of a complementary functional group G on a surface of the substrate with a compound of Formula II

15



II

20

wherein

X² is a substrate-reactive functional group selected from a carboxy, halocarbonyl, halocarbonyloxy, cyano, hydroxy, mercapto, isocyanato, halosilyl, alkoxysilyl, acyloxysilyl, azido, aziridinyl, haloalkyl, tertiary amino, primary aromatic amino, secondary aromatic amino, disulfide, alkyl disulfide, benzotriazolyl, phosphono, phosphoroamido, phosphato, or ethylenically unsaturated group;

25

R⁴ and R⁵ together with a dicarboximide group to which they are attached form a four to eight heterocyclic or heterobicyclic group that can be fused to an optional aromatic group, optional saturated or unsaturated cyclic group, or optional saturated or unsaturated bicyclic group;

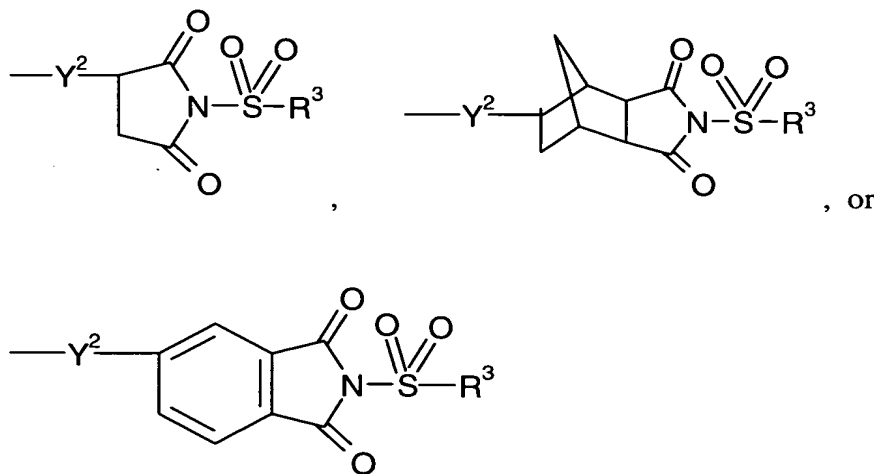
Y^2 is a single bond or a divalent group selected from alkylene, heteroalkylene, arylene, carbonyl, carbonyloxy, carbonylimino, oxy, thio, $-NR^d$ - where R^d is hydrogen or alkyl, or combinations thereof;

R^3 is an alkyl, aryl, aralkyl, or $-NR^bR^c$ wherein R^b and R^c are each an alkyl group or taken together with the nitrogen atom to which they are attached form a four to eight membered heterocyclic group;

r is equal to 1 when X^2 is monovalent or equal to 2 when X^2 is a divalent group;

G is the complementary functional group capable of reacting with X^2 ; and said tethering group is unsubstituted or substituted with a halo, alkyl, alkoxy, or combinations thereof.

23. The article of claim 22, wherein the tethering group comprises an attachment group and a group selected from



wherein the tethering group is unsubstituted or substituted with a halo, alkyl, alkoxy, or combination thereof.

24. The article of claim 22, wherein the substrate comprises a polymeric material.

25. The article of claim 22, wherein the substrate comprises a polyimide or polyester film.

26. The article of claim 22, wherein the substrate is multilayered and has an outer layer comprising diamond-like glass.

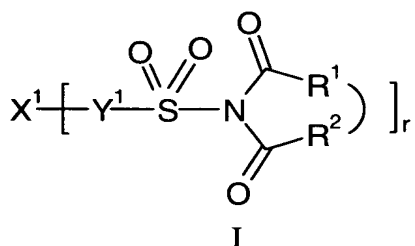
27. The article of claim 22, wherein the substrate is multilayered and has an outer layer comprising gold.

28. The article of claim 22, wherein the substrate is multilayered and comprises a polyimide or polyester layer, a diamond-like glass outer layer, and a diamond-like carbon layer positioned between the polyimide or polyester layer and the diamond-like glass layer.

29. The article of claim 22, wherein the substrate is a polymeric bead.

30. The article of claim 22, wherein the substrate is a bead comprising a polysaccharide.

31. A method of immobilizing an amine-containing material, said method comprising: selecting a compound of Formula I



wherein

X¹ is a substrate-reactive functional group selected from a carboxy, halocarbonyl, halocarbonyloxy, cyano, hydroxy, mercapto, isocyanato, halosilyl, alkoxysilyl, acyloxysilyl, azido, aziridinyl, haloalkyl, tertiary amino, primary aromatic amino, secondary aromatic amino, disulfide, alkyl disulfide, benzotriazolyl, phosphono, phosphoroamido, phosphato, and ethylenically unsaturated group;

Y¹ is a single bond or a divalent group selected from an alkylene, heteroalkylene, arylene, carbonyl, carbonyloxy, carbonylimino, oxy, thio, -NR^d- where R^d is hydrogen or alkyl, or combinations thereof;

R^1 and R^2 together with a dicarboximide group to which they are attached form a four to eight membered heterocyclic or heterobicyclic group that can be fused to an optional aromatic group, optional saturated or unsaturated cyclic group, or optional saturated or unsaturated bicyclic group;

5 r is 1 when X^1 is a monovalent group or equal to 2 when X^1 is a divalent group; and

said compound is unsubstituted or substituted with a halo, alkyl, alkoxy, or combinations thereof;

10 providing a substrate having a complementary functional group capable of reacting with X^1 ;

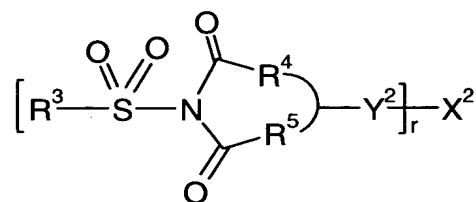
preparing a substrate-attached tethering group by reacting X^1 with the complementary functional group on the substrate resulting in an ionic bond, covalent bond, or combination thereof;

15 reacting a N-sulfonyldicarboximide group of the substrate-attached tethering group with an amine-containing material to form a connector group between the substrate and the amine-containing material.

32. An article prepared according to the method of claim 31.

20 33. The method of claim 31, wherein the immobilized amine-containing material is selected from an amino acid, peptide, protein, enzyme, immunoglobulin, DNA, RNA, or fragment thereof.

25 34. A method of immobilizing an amine-containing material comprising:
selecting a compound of Formula II



II

that is unsubstituted or substituted with a halo, alkyl, carboxy, alkoxycarbonyl, nitrile, or combinations thereof where

X^2 is a substrate-reactive functional group selected from a carboxy, halocarbonyl, halocarbonyloxy, cyano, hydroxy, mercapto, isocyanato, halosilyl, alkoxysilyl, acyloxysilyl, azido, aziridinyl, haloalkyl, tertiary amino, primary aromatic amino, secondary aromatic amino, disulfide, alkyl disulfide, benzotriazolyl, phosphono, phosphoroamido, phosphato, and ethylenically unsaturated group;

R^4 and R^5 together with a dicarboximide group to which they are attached form a four to eight membered heterocyclic or heterobicyclic group that can be fused to an optional aromatic group, optional saturated or unsaturated cyclic group, or optional saturated or unsaturated bicyclic group;

Y^2 is a single bond or a divalent group selected from alkylene, heteroalkylene, arylene, carbonyl, carbonyloxy, carbonylimino, oxy, thio, $-NR^d$ - where R^d is hydrogen or alkyl, or combinations thereof;

R^3 is an alkyl, aryl, aralkyl, or $-NR^bR^c$ wherein R^b and R^c are each an alkyl group or taken together form a four to eight membered heterocyclic group;

r is equal to 1 when X^3 is monovalent or equal to 2 when X^3 is a divalent group; and

said compound is unsubstituted or substituted with a halo, alkyl, alkoxy, or combinations thereof;

providing a substrate having a complementary functional group capable of reacting with X^2 ;

preparing a substrate-attached tethering group by reacting X^2 with the complementary functional group on the substrate resulting in an ionic bond, covalent bond, or combination thereof; and

reacting a N-sulfonyldicarboximide group of the substrate-attached tethering group with an amine-containing material to form a connector group between the substrate and the amine-containing material.

35. An article prepared according to the method of claim 34.

36. The method of claim 34, wherein the immobilized amine-containing material is selected from an amino acid, peptide, protein, enzyme, immunoglobulin, DNA, RNA, or fragment thereof.